An Estimation of Homogeneity in Crop Plants, With Special Reference To Genetic Vulnerability in the Dry Bean, Phaseolus Vulgaris L.

M. W. Adams

Michigan State University, East Lansing, Michigan

Summary

A general method of quantitatively assessing genetic similarity among a set of cultivars of a given crop is proposed, and its application to dry beans in the United States is demonstrated. The method is based upon the multi-variate technique of Principal Components Analysis. Using this method it was possible to calculate a "distance" metric between any two cultivars in the set and to show that such distances were highly inversely correlated with genetic relationship estimated from a knowledge of breeding ancestry.

On the basis of distances among cultivars within given production regions (states in the U.S. in this case) and knowledge of the acres of each cultivar grown in the region, an average weighted distance metric appropriate to each region was calculated. Each derived distance metric serves as an index of "genetic homogeneity" for the crop in that region. Arguments are presented for relating the degree of vulnerability to a disease epidemic to the distance index. Indexes are calculated for nine of the major bean producing states in the United States from which it is concluded that, from the standpoint of genetic vulnerability, Colorado is most vulnerable and California least vulnerable to a region-wide epidemic affecting the bean crop.

* * * * * * * * * * * *

Heritability of Available Methionine and Other Characteristics of the Proteins of Dry Beans

Henry J. Fabian[1] and Donald R. Wood

Department of Agronomy, Colorado State University, Fort Collins, Colorado 80523

Cereals provide the bulk of the world's supply of protein for human diets. Grain legumes are important because of their relatively high protein content and their supplemental effect on the protein quality of cereal proteins. Diets of corn and beans, for example, provide protein of maximum value when the diet consists of equal proportions of corn and bean proteins. If bean proteins are not digestible and are poorly utilized, diets are of reduced value.